

Typhoon Carmen (15W) was the first of five significant tropical cyclones that occurred in October. Carmen followed a recurvature track that took the system between Guam and Saipan. Carmen was slow developing, but deepened rapidly prior to recurvature. The point of recurvature was 935 nm (1730 km) east of Taiwan. JTWC's forecast statistics were excellent.

Carmen spawned in an area of convergent flow associated with the near-equatorial trough east of the dateline. On 270600Z September, the disturbed area that became Carmen was first mentioned on the Significant Tropical Weather Advisory (ABPW PGIW) 350 nm (648 km) east of Majuro Atoll. The poorly organized convection was enhanced by divergent flow aloft. At 270000Z, when the surface vorticity center was first noted on satellite imagery, the minimum sea-level pressure (MSLP) was estimated to be 1009 mb, and the maximum surface winds 10 to 15 kt (5 to 8 m/sec). The tropical disturbance's organization remained poor for the next four days.

A Tropical Cyclone Formation Alert was issued on 011230Z October based on a flare-up of cloudiness detected on the satellite imagery. Because of the system's rapid development and location 330 nm (611 km) east-southeast of Guam, it presented an immediate threat to the island. The first warning for Tropical Depression 15W followed 11-hours later when satellite imagery showed continued growth. Later, aircraft reconnaissance at 020326Z fixed a low-level circulation center 480 nm (889 km) east of Guam, which was a significant displacement from the earlier satellite derived position. These data, which included a MSLP of 1001 mb, maximum 1500 ft (457 meters) winds of 45 kt (23 m/sec), and maximum surface winds of 40 kt (21 m/sec), led JTWC to relocate and upgrade Carmen to tropical storm intensity. Initially Carmen was forecast to pass south of Guam. It soon became evident that a track between the islands of Guam and Saipan was preferred.



Figure 3-15-2. Winds and heavy rainshowers affect travelers on Guam on 3 October (Photo courtesy of Guam Publications, Inc.).

Carmen intensified at a slower rate than normal. This slow intensification was advantageous for the Mariana Islands. The maximum intensity at the time of passage through the Marianas was only 55 kt (28 m/sec) instead of an expected 77 kt (40 m/sec). The synoptic data (see Figure 3-15-1) reflects Carmen's presence between the islands of Rota, which is 60 nm (111 km) southwest of Saipan, and Saipan (WMO 91232) at 031200Z. Automated weather reporting stations provided the timely observations from Rota and Saipan. Maximum wind reports from Saipan were 31 kt (16 m/sec) with gusts to 41 kt (21 m/sec) at 031200Z; for Rota, 35 kt (18 m/sec) with gusts to 53 kt (27 m/sec) at 031500Z; and for Guam (Figure 3-15-2), 30 kt (15 m/sec) with gusts to 40 kt (21 m/sec) at 031155Z. Carmen did bring heavy rain, 10 to 11 inches (254 to 279 mm) for Guam, and flooding to the southern Mariana Islands, but caused little structural damage and no loss of life.

Aircraft reconnaissance at 032350Z, which reported a MSLP of 993 mb and estimated the maximum surface wind to be 65 to 70 kt (33 to 36 m/sec), led JTWC to upgrade Carmen from tropical storm to typhoon. Aircraft reconnaissance at 042355Z reported a drop in MSLP of 26 mb to 967 mb and at 051510Z reported another drop of 28 mb to a MSLP of 939 mb. This was a total decrease of 54 mb or an average of 1.4 mb/hr for 39-hours (see Figures 3-15-3, 3-15-4 and 3-15-5).

The forecasts for the recurvature of Carmen were excellent. The 72-hour forecast errors covering eight warnings (the third warning through the tenth) were less than 80 nm (148 km). One of the pieces of data that helped was a synoptic track requested and flown on 03 October from 0000Z to 1500Z. This synoptic track (see Figure 3-15-6) revealed a weakness at 500 mb in the subtropical ridge 480 nm (889 km) northwest of Guam.

Typhoon Carmen reached its maximum intensity of 100 kt (51 m/sec) with gusts to 125 kt (64 m/sec) at 051800Z. Afterward, cooler, drier air associated with a mid-latitude trough east of Japan, was entrained into the system. The aircraft mission at 052306Z reported that the eyewall had become ragged in the south through northwest segment. Satellite imagery at 061200Z confirmed Carmen was being sheared from the west by strong upper-level southwesterly flow, which caused the tropical cyclone to become elongated southwest to northeast. By that time,

	11Z	12Z	13Z
SAIPAN PGSN WMO 91232	G41 	PK WND 31 	PK WND 31
ROTA 60NM SW OF SAIPAN	 PK WND 23	 PK WND 18	PK WND 45
ANDERSEN PGUA WMO 91218	G37 PK WND 39	G49 PK WND 39	G41 PK WND 39
AGANA PGUM WMO 91212	G41 PK WND 45	G42 PK WND 45	G32 PK WND 46

Figure 3-15-1. Synoptic data showing Carmen's passage between Saipan (WMO 91232) and the island of Rota, which is 60 nm (111 km) southwest of Saipan.

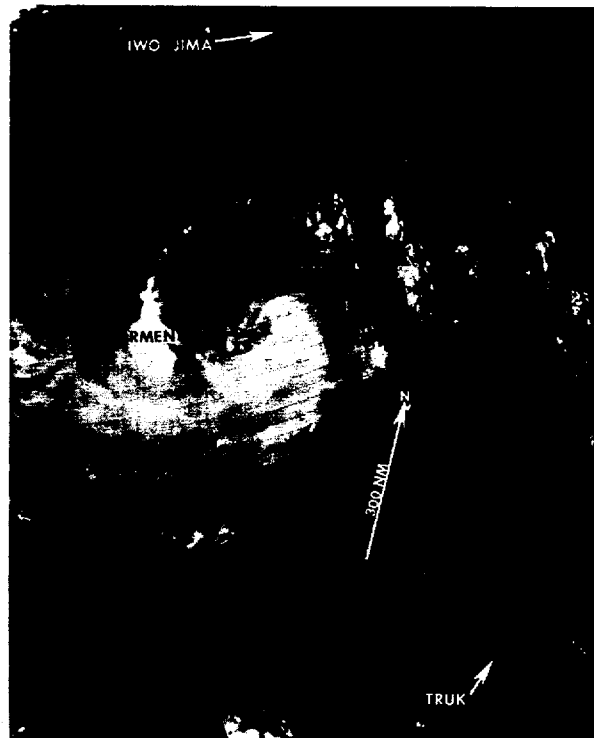


Figure 3-15-3. Typhoon Carmen before rapid deepening and just after it passed Guam (040444Z October NOAA visual imagery).

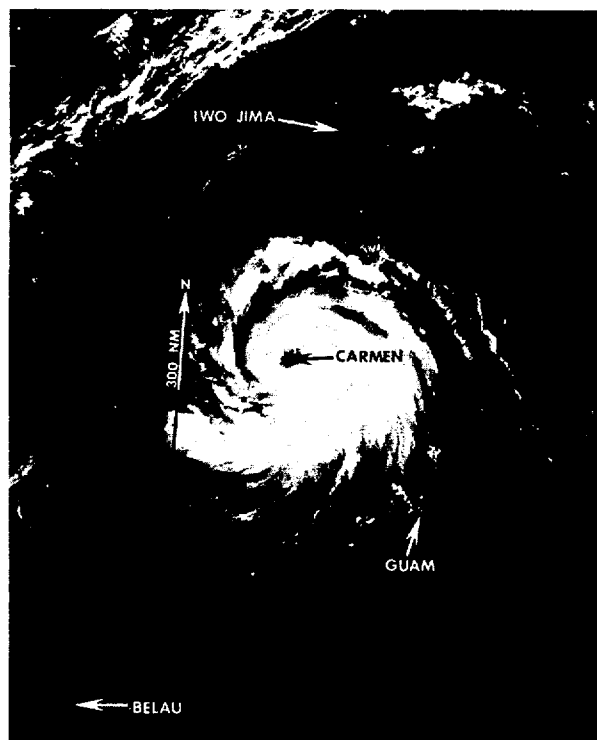


Figure 3-15-4. A mature Typhoon Carmen 19-hours after Figure 3-15-3 and rapid deepening (050013Z October DMSP visual imagery).

Carmen had already passed its point of recurvature. At 070005Z, the aircraft reconnaissance reported moderate to severe turbulence in the northwest quadrant of the system and indicated the eye was no longer present. These were indicators of extratropical transition.

Subsequently, Typhoon Carmen accelerated in forward speed to about 25 kt (13 m/sec), while maintaining an intensity of 80 kt (41 m/sec). After recurvature on October 7th, the MSLP steadily decreased and the winds remained nearly constant. At 071600Z, satellite imagery indicated Carmen had acquired subtropical characteristics and the maximum winds were 65 kt (34 m/sec). A wind maximum on the eastern portion of the trough caused Carmen to accelerate toward the northeast faster than forecast.

JTWC continued warning on Carmen until 081200Z when the system completed extratropical transition. At that time, extratropical Carmen had 60 kt (31 m/sec) maximum winds with gusts to 75 kt (39 m/sec) and was well north of the tropics.



Figure 3-15-5. Inside Typhoon Carmen's eye. This scene is from the aircraft reconnaissance mission (AF966 0715 CARMEN) at 042355Z. Compare the low cloud spiral in this figure with the remotely sensed eye in Figure 3-15-4 (Photo courtesy of Captain Susan K. Waters, USAF).

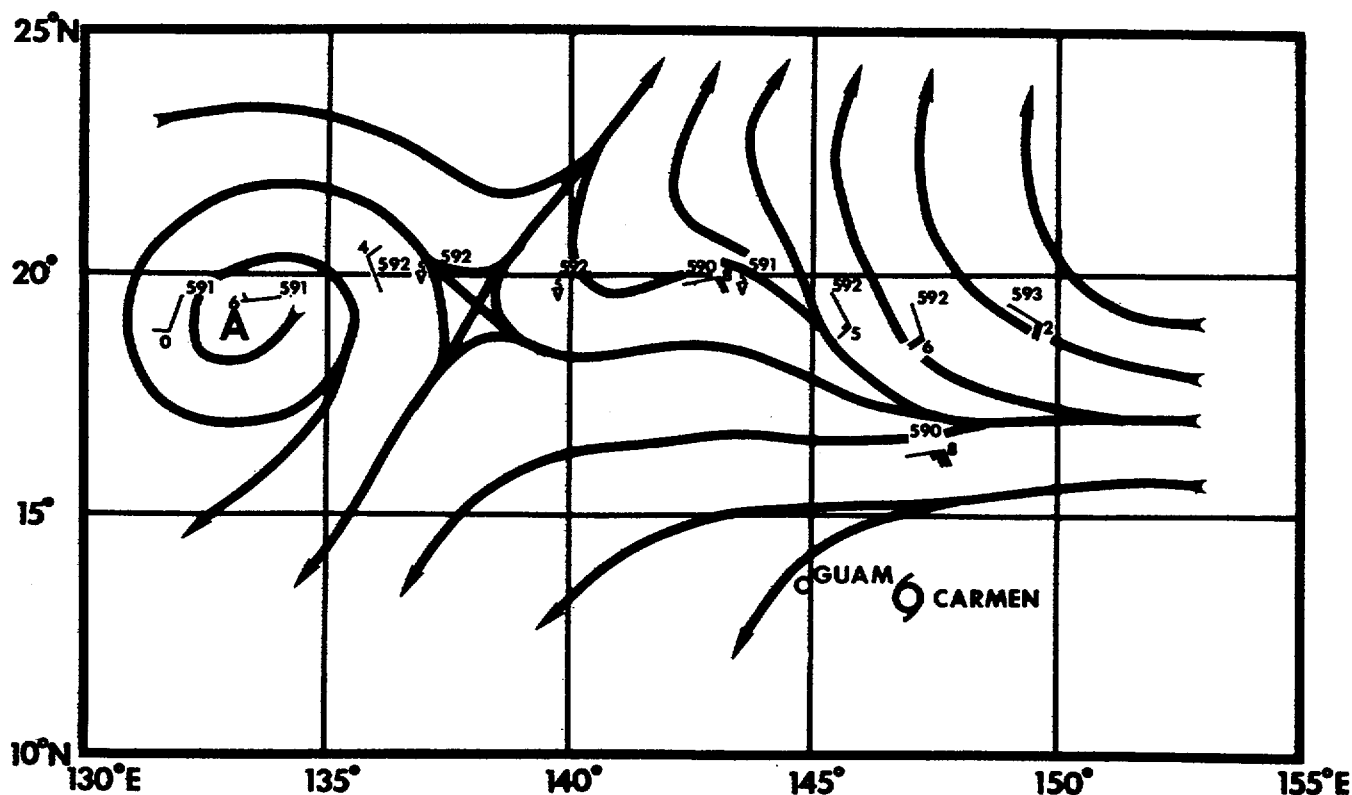


Figure 3-15-6. The synoptic track from 030000Z to 031500Z October 1986 identifies a break in the subtropical ridge.